Stealth Defeat by Induction of Arc Between Farraday Mesh Layers by Exploiting Knowledge of Mesh Size

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Introduction

Platforms such as the F-22 Raptor utilize a great many mesh layers designed to resonate with electromagnetism at a variety of frequencies. The thinner the mesh material, the more layers can be stacked upon one another and the more frequencies can be absorbed in their totality. When frequencies in between these frequencies are emitted absorption can be incomplete.

Modern RADAR systems have attempted to defeat stealth by, amongst other things, finding frequencies through bruteforcing which fall in the narrow gaps between the coverage of these layers. Even when these ideal frequencies are identified, the RADAR return is very weak, limiting detection range.

An alternative approach based upon having knowledge of the mesh sizes may enable these aircraft to be detected by turning the stealthy skin of the aircraft into a transmitter.

Abstract

Rather than emitting powerful microwave energy at non-resonant frequencies between those which are optimal for EM absorption in a stealth skin based upon the overlapping mesh approach, an adversary might attempt to purposefully emit extremely intense EM in the specific direction of a stealthy aircraft at a combination of two frequencies simultaneously, both of which are calibrated to be absorbed entirely by the skin of the aircraft. Counterintuitively, although this would not result in the direct return of any of the EM, it may result in arcing between the thin layers, which are coated with a very small amount of insulating material which is unlikely to stand up well to arcing effects.

These electrical arcs, if they could be brought about, would cause the integument of a stealthy aircraft utilizing this type of stealth system to emit radio-frequency energy in the kilohertz regime which could be detected from a great distance away and used to triangulate the position of the aircraft.

Conclusion

As information likely already exists concerning signal return strength relative to frequency for an older platform such as the F-22, an adversary might attempt to purposefully utilize frequencies of *least return* rather than *greatest return* in neighboring pairs and to look for emissions not at the frequency of RADAR emission, but rather on an unrelated frequency in the kilohertz range.